

Lemongrass

By Salvatore Battaglia



BOTANICAL NAME

West Indian lemongrass –
Cymbopogon citratus DC

East Indian lemongrass –
Cymbopogon flexuosus Nees
ex Steud.

SYNONYMS

C. citratus – Guatemala
lemongrass

C. flexuosus – Cochin
lemongrass, native lemongrass

FAMILY

Poaceae (Gramineae)



BOTANY AND ORIGINS

Lemongrass oil is produced from two distinctly different species of *Cymbopogon*. *C. citratus* and *C. flexuosus* are tufted perennial grasses with numerous stiff stems arising from a short rhizomatous rootstock.¹

C. flexuosus is a native of India and *C. citratus* is possibly a native of Sri Lanka. *C. citratus* is widely cultivated all over the world and has been named West Indian lemongrass. India is the major producer of East Indian lemongrass. The major producers of West Indian lemongrass are Guatemala, Madagascar, the Comoro Islands, Brazil, Malaysia and Vietnam.²

Weiss states that only young and rapidly expanding leaves synthesise and accumulate essential oils. The leaf blades have a higher oil content than the leaf sheaths and the oil content increases from the leaf base to the tip.¹

Arctander explains that in many tropical regions, the production of lemongrass oil is a by-product of cattle raising. Where cattle feed is scarce, the exhaust grass from distillation can offer a good nutritive when added to molasses residues. He also explains that lemongrass exhausts the soil of nutrients and that when it is used as feed for cattle, the cows become the perfect recycling machine returning the nutrients back to the soil.²

The name *cymbopogon* is derived from the Greek words *kymbe* meaning boat and *pogon* meaning beard, referring to the flower spike arrangement.³

METHOD OF EXTRACTION

Lemongrass oil is steam-distilled from fresh or partly dried leaves of *C. citratus* or *C. flexuosus*.²

CHARACTERISTICS

Lemongrass oil is a yellow or amber coloured somewhat viscous liquid with a very strong, fresh grassy, herbaceous and citrus odour. *C. citratus* usually has an earthy undertone reminiscent of citronella oil, while *C. flexuosus* smells sweeter, distinctly more lemony, fresh and light.²

CHEMICAL COMPOSITION

The chemical composition of lemongrass oil was reported as follows:¹

Constituent	<i>C. flexuosus</i>	<i>C. citratus</i>
myrcene	0.46%	8.2 – 19.2%
limonene	2.42%	trace
linalool	1.34%	0.8 – 1.1%
citronellal	0.37%	0.1%
geranyl acetate	1.95%	1.0%
nerol	0.39%	0.3 – 0.4%
geraniol	3.80%	0.5 – 0.6%
neral	30.06%	25 – 28%

geranial	51.19%	45.2 – 55.9%
citronellol	0.44%	0.1%

C. citratus oil usually has a slightly lower citral (neral + geranial) content and a significantly higher amount of myrcene.

ADULTERATION

As lemongrass is an inexpensive oil, it is unlikely to be adulterated with synthetics. However, it can be substituted by *Litsea cubeba* of a similar composition.⁴

HISTORY

Lemongrass was originally used as a food flavouring in Asia. The fresh leaves are crushed in water and used as a hair wash and toilet water in India.¹

TRADITIONAL MEDICINE

Lemongrass herb is used in Ayurveda for infectious diseases and fever and as a sedative and insecticide.⁴

Lemongrass herb is also used in traditional Chinese medicine to treat colds, headache, stomach ache, abdominal pain and rheumatic pain.⁵

HERBAL

A decoction of lemongrass leaf is taken orally for the relief of sore throat. The tea is also used as an emetic, anti-inflammatory, diuretic and sedative. In South East Asia, the tea is taken orally as an emmenagogue.³ The dried leaves are commonly used as a 'lemon' flavour in herbal teas.⁵

The German Commission E lists lemongrass oil for disorders and discomforts of the gastrointestinal tract, muscle pain, and neuralgia, colds and various nervous disturbances and for conditions of exhaustion.⁶

FOOD, PERFUMERY AND FLAVOURING

It is often used as a masking fragrance in deodorants, waxes, polishes, detergents and insecticides.¹ Lemongrass oil is used as a fragrance component in soaps and detergents.⁵ However, Arctander states that lemongrass is not used in perfumes.²

OTHER USES

The leaves can also be used as a source of cellulose and paper production. A majority of lemongrass essential oil is used for citral production, which is then used for perfumery and flavour use or in the synthesis of vitamin A.¹ Citral from lemongrass oil is used in the production of ionones and methyl ionones as well.²

PHARMACOLOGY AND CLINICAL STUDIES

Many pharmacological studies involving lemongrass essential oil have been published. A systemic review of these studies will not be attempted. Rather, I have chosen a selection of studies that support the traditional and clinical uses.

Many studies have confirmed that lemongrass oil has potent antifungal and antimicrobial activities. However, it does present a high risk of skin irritancy and sensitising activity on the skin. It is interesting to note that some studies have confirmed the efficacy of lemongrass oil as an antimicrobial agent when vaporised.

While numerous studies have demonstrated that lemongrass oil potentially has many pharmacological activities, I would like to see more studies to examine safe ways of administering the essential oil to ensure there is no risk of dermal irritation and sensitisation.

While lemongrass oil has potent antifungal activity, I would never recommend using lemongrass oil neat on the skin to treat fungal infection because of the high risk associated with dermal irritation and sensitisation.

Antifungal activity

Lemongrass oil exhibits excellent antifungal properties.^{3,7,8}

Undiluted lemongrass oil was more effective than commercial fungicides such as benzoic acid, nystatin and tineafox against pathogenic fungi. It was stated that the antifungal activity was associated with the high citral content.⁹

Another in vitro study confirmed that lemongrass oil exhibited the most effective killing activity and possessed the strongest inhibitory effect on *Candida* biofilm formation. The oil was also found to inhibit germ tube formation which might affect adherence.¹⁰

Lemongrass oil exhibited significant antifungal activity against *Candida albicans*, *Candida tropicalis* and *Aspergillus niger*. It has been suggested that the strong inhibitory effect of lemongrass against *Candida* species may result from a synergy of monoterpenes and other compounds such as cymene, terpinene and linalool.¹¹

Anti-inflammatory activity

An in vivo study confirmed that a number of aldehydes in lemongrass oil had antioxidant activity that may have contributed to the anti-inflammatory effects observed when orally administered to rats. It has been suggested that lemongrass oil inhibits prostaglandin biosynthesis in the same way as salicylate drugs and non-steroid anti-inflammatory drugs.^{11,12}

Citral, a major component of lemongrass essential oil, has been shown to inhibit the production of interleukin (IL 1 β) and interleukin 6 (IL-6) in lipopolysaccharide (LPS)-stimulated alveolar macrophages of normal mice. Citral also inhibits the production of pro-inflammatory cytokines such as tumor necrosis factor- α (TNF- α).¹¹

Antimicrobial activity

Many studies have confirmed that lemongrass oil has excellent antimicrobial activities.^{3,13,14,15,16} It has been suggested that lemongrass and other essential oils rich in oxygenated compounds such as aldehydes and monoterpene alcohols are more active, whereas those essential oils containing larger amounts of monoterpene hydrocarbons and/or sesquiterpenes had lower antimicrobial activity.¹³

Another study demonstrated that lemongrass oil exhibited excellent antimicrobial activity in the vapour phase, which was significantly enhanced when used in combination with negative ions.⁸

An in vitro study confirmed that lemongrass oil exhibited significant antibacterial activity against *Streptococcus pyogenes*, which plays an important role in the pathogenesis of tonsillitis. Lemongrass oil was as effective as *Cinnamomum verum*, *Thymus vulgaris* ct. thymol, *Origanum compactum* and *Satureja montana* essential oils, which are also well-known essential oils for their potent antimicrobial activity.¹⁷

Many cleansers used to disinfect surfaces

contain harsh and irritant chemicals. In this study, surface cleansers containing essential oils and citric acid were evaluated for their disinfectant activity. A blend of lemongrass and orange oil exhibited the highest disinfectant activity when used as a surface disinfectant. It was recommended that if it was used as a surface cleanser in hospitals and households it may significantly reduce the spread of pathogens from environmental surface to healthcare workers and the general public.¹⁸

A study compared a topical gel containing various essential oils and evaluated their antibacterial activity against methicillin-resistant *Staphylococcus aureus* (MRSA) skin infections. The topical gel was formulated using Carbopol 940, hydroxypropylmethyl cellulose, sodium carboxymethyl cellulose. The study then compared the gel blended with thyme oil alone, the gel blended with lemongrass alone and a blend of lemongrass and thyme oil. All the gel preparations exhibited strong antibacterial activity, however, the antibacterial activity of the gel containing the two essential oils was approximately the sum of those containing the individual oils. It was also noted that when applied to the human skin there was no skin irritation.¹⁹

Antinociceptive activity

Many studies have confirmed that lemongrass oil exhibited a significant antinociceptive activity.^{3,20}

Another study confirmed that myrcene was identified as the most potent analgesic component of lemongrass essential oil. It was reported that unlike the central analgesic effect of morphine, myrcene did not cause tolerance on repeated injection in rats. Myrcene has a similar direct analgesic effect to peripherally acting opiates.²¹

Cardioprotective activity

An in vivo study involving mice confirmed that oral doses of lemongrass oil at a dose of 200 mg/kg of body weight exhibited cardioprotective and anti-lipid peroxidative comparable with that of vitamin E.²²

Cholesterol lowering activity

A capsule containing 140 mg lemongrass oil was given daily to 22 individuals with high cholesterol levels for 90 days. The study demonstrated that lemongrass significantly lowered the cholesterol levels of 36% of the participants. It was

suggested that lemongrass oil suppressed the activity of HMG-CoA (3-hydroxy-3-methylglutaryl coenzyme A) reductase.²³

Insecticidal activity

C. citratus and *C. flexuosus* oils were found to give almost complete protection against *Anopheles culicifacies* (a principal malaria carrier) for up to 11 hours. The oils were considered comparable with synthetic repellents of dimethyl and dibutyl phthalate.²⁴

An in vivo study investigated the topical application of 1.73 g of lemongrass oil in 22.73 g of petroleum jelly-based cream. The results of the study showed that lemongrass essential oil can provide substantial protection against mosquitos and insect bites similar to that of synthetic DEET-based products. It was stated to be the only essential oil to provide 80 to 90% protection. The authors of the study recommended blending lemongrass with other essential oil to provide longer protection up to 6 hours. They also stated that concentrations above 3% could provide protection for about 3 to 4 hours without causing any skin irritation.²⁵

Another study also confirmed that lemongrass oil exhibited protection against biting from two mosquito species *Anopheles aegypti* (98.66 minutes protection and 0.97% biting rate) and for *Anopheles dirus* (210-minute protection and a 0.93% biting rate). A blend of lemongrass and basil provided the most effective repellency activity.²⁶

Oral health

A study reviewed the role of lemongrass in improving dental health. Lemongrass oil is recommended for the prevention and treatment of periodontitis. It has also been recommended in mouthwash or toothpaste to prevent plaque formation.²⁷

Sedative activity

Lemongrass essential oils was found to have sedative and hypnotic activity through pentobarbital sleeping time, when orally administered to mice. The oil was also found to have anxiolytic activity and anticonvulsant activity.²⁸

The aim of another study was to examine the anxiolytic effect of lemongrass oil aroma on healthy human volunteers who were subjected to an anxiogenic situation. Forty male volunteers were allocated to different groups. One group inhaled lemongrass essential oil, another

group inhaled tea tree oil and another was the non-aromatic control group. Although the researchers concluded more investigations are necessary to clarify the clinical relevance of lemongrass oil as an anxiety treatment, this study showed that a very brief exposure to lemongrass oil has a perceived anxiolytic effect.²⁹

ENERGETICS

Holmes states that lemongrass oil regulates the *Qi* and harmonises the *Shen*. It is recommended for conditions associated with irritability, moodiness, anger and agitated depression.³³

According to the principles of Five elements, lemongrass oil strengthens the *Wood* element.

SUBTLE

Worwood states that the scent of lemongrass oil helps to clear regrets and shame. It encourages us to forgive those who have dishonoured and discredited us.³⁷

Holmes states that the green and lemony scent of lemongrass oil helps to promote emotional renewal. He explains that it dispels pessimism and mental depression and helps to open the door to new positive experiences.³³

Zeck explains that the intense radiant energy of lemongrass oil inspires expansion on all levels. She recommends it whenever there is a sense of restriction or limitation in life. It lifts the spirits and gets things moving again. Lemongrass encourages us to embark on a glorious journey of discovery.³⁸

PROPERTIES

Analgesic, antidepressant, antimicrobial, antiseptic, astringent, bactericidal, carminative, deodorant, febrifuge, fungicidal, galactagogue, insecticidal, nervine, sedative (nervous system), tonic^{30,31,32}

Actions supported by clinical studies

Analgesic, antimicrobial, antiseptic, insecticidal, nervine

AROMATHERAPY USES

Antimicrobial

The antimicrobial activity of lemongrass oil indicates that it would be excellent in a vaporiser to disinfect the air.³⁴

Lemongrass oil is often recommended for a broad range of fungal infections including athlete's foot, candidiasis, oral thrush, nail-bed infections, tinea and jock itch. Holmes recommends lemongrass oil for the treatment of cold sores and shingles.³³

Digestive system

Lemongrass oil is considered a stimulant of the digestive system and is recommended for colitis, indigestion and gastroenteritis.^{30,31,34}

Musculoskeletal system

Lemongrass oil is referred to as the connective tissue oil. Lemongrass tightens the elastin fibres in the epidermis and in the subcutis. The oil is recommended in the after-care of sports injuries, sprains, bruises and dislocations.³⁵

Holmes recommends lemongrass for muscular tension and pain, acute arthritis, rheumatic pain and tendinitis.³³

Psychological

Lemongrass oil has such a fresh, green and strong citrus aroma, which is enlivening and uplifting. Holmes states that when it is inhaled in low amounts it induces feelings of renewal and transformation and helps to resolve day-to-day distressing feelings and emotions. He recommends lemongrass whenever we are overcome by negative and distressed feelings and whenever we experience mental fatigue, poor concentration, mental and emotional confusion and negative thinking and pessimism.³³

Lemongrass is considered a secret aid for people who have trouble starting in the morning. Fischer-Rizzi describes the effect of the scent of lemongrass as taking a refreshing, cool morning shower.³⁴

Skin care

Lemongrass oil is often recommended as a skin tonic and it is used in cleansing lotions and creams for its astringent properties.^{30,33,34}

One study found that a hair tonic with 10% lemongrass oil was very effective for treating dandruff.³⁶ However, this is a rather high concentration and the risk of irritation and sensitisation to the scalp would be very high. I would be very cautious in the use of lemongrass oil for skin care as it may cause dermal irritation or sensitisation.

BLENDING

Aromatherapy

- To alleviate mental fatigue and poor concentration consider blending lemongrass oil with essential oils such as basil, bergamot, black pepper, ginger, lemon, cold-pressed lime, peppermint or rosemary.
- To make a disinfectant blend that can be added to a vaporiser, consider blending lemongrass oil with essential oils such as cinnamon bark, fragonia, kunzea, lemon, manuka, sweet orange, tea tree or thyme.
- For the relief of muscular aches and pains, consider blending lemongrass oil with essential oils such as cajeput, ginger, kunzea, lemon-scented eucalyptus, spike lavender, peppermint or rosemary.
- When lemongrass oil is blended with essential oils such as clove bud, cinnamon bark or tea tree, it becomes a very effective antifungal blend.
- To promote mental and emotional clarity and a sense of optimism, consider blending lemongrass oil with essential oils such as bergamot, cold-pressed lime, petitgrain or sweet orange.
- As a natural insect repellent consider blending lemongrass oil with essential oils such as cajeput, Atlas cedarwood, Virginian cedarwood, Buddha wood, citronella, 1,8-cineole-rich eucalypts, peppermint eucalyptus, niaouli, spike lavender, peppermint or tea tree.

Perfumery

Lemongrass oil is not commonly used in perfumery.²

HOW TO USE

Bath

Lemongrass essential oil is not recommended for use in a bath.

Topical

Massage

Inhalation

Direct inhalation, diffuser, oil vaporiser

SAFETY

Lemongrass oil is not considered toxic. Lis-Balchin cites studies that show there was no irritation or sensitisation at 4% on humans; however, it is regarded as a very sensitising essential oil.⁴

Tisserand & Young recommend a dermal maximum of 0.7% to avoid skin sensitisation. They recommend not using on persons with hypersensitive, diseased or damaged skin and to use topically on children under 2 years of age.³⁹

REFERENCES

1. Weiss EA. *Essential oil crops*. CAB International, Wallingford, 1997.
2. Arctander S. *Perfume and flavour materials of natural origin*. Allured Publishing, Carol Stream, 1994.
3. Shah G et al. *Scientific basis for the therapeutic use of Cymbopogon citratus, Stapf (lemongrass)*. Journal of Advanced Pharmaceutical Technology & Research, 2011; 2(1): 3-8. doi: 10.4103/2231-4040.79796
4. Lis-Balchin M. *Aromatherapy science – a guide for healthcare professionals*. Pharmaceutical Press, London, 2006.
5. Khan I, Abourashed E. *Leung's encyclopedia of common natural ingredients used in food, drugs and cosmetics*. 3rd edn. John Wiley & Sons, New Jersey, 2010.
6. Blumenthal M et al. *The complete German commission E monographs: therapeutic guide to herbal medicine*. American Botanical Council, Austin, 1998.
7. de Bona da Silva C et al. *Antifungal activity of lemongrass oil and citral against Candida spp.* The Brazilian Journal of Infectious Diseases, 2008; 12(1): 63-66.
8. Tyagi AK et al. *Liquid and vapour-phase antifungal activities of selected essential oils against Candida albicans: microscopic observations and chemical characterisation of Cymbopogon citratus*. BMC Complementary and Alternative Medicine, 2010; 10: 65. doi: 10.1186/1472-6882-10-65
9. Qamar S et al. *Antifungal activity of lemongrass essential oils*. Pakistan Journal of Science and Industrial Research, 1992; 35(6): 246-248. Cited in Quintessential Aromatics database, 2013.
10. Taweechaisupapong S et al. *Inhibitory effect of lemongrass oil and its major constituents on Candida biofilm and germ tube formation*. South African Journal of Botany, 2012; 81: 95-102. Cited in Quintessential Aromatics database, 2013.
11. Boukhatem MN et al. *Lemon grass (Cymbopogon citratus) essential oil as a potent anti-inflammatory and antifungal drugs*. Libyan Journal of Medicine, 2014; 9(1): 25431. doi: 10.3402/ljm.v9.25431

12. Gbenou JD et al. *Phytochemical composition of Cymbopogon citratus and Eucalyptus citriodora essential oils and their anti-inflammatory and analgesic properties on Wistar rats*. Molecular Biology Reports, 2013; 40(2): 1127–1134. doi: 10.1007/s11033-012-2155-1
13. Chalchat JC et al. *Correlation between chemical composition and antimicrobial activity. VI Activity of some African essential oils*. Journal of Essential Oil Research, 1997; 9(1): 67-75. Cited in Quintessential Aromatics database, 2013.
14. Onawunmi GO. *Evaluation of the antifungal activity of lemongrass oil*. International Journal of Crude Drug Research, 1989; 27(2): 121-126. Cited in the Aromatherapy Database, by Bob Harris, Essential Oil Resource Consultants, UK, 2000.
15. Onawunmi GO et al. *Antibacterial constituents in the essential oil of Cymbopogon citratus (DC.) Stapf*. Journal of Ethnopharmacology, 1984; 12(3): 279-286. Cited in the Aromatherapy Database, by Bob Harris, Essential Oil Resource Consultants, UK, 2000.
16. Onawunmi GO, Ogunlana EO. *A study of the antibacterial activity of the essential oil of lemongrass (Cymbopogon citratus (DC.) Stapf)*. International Journal of Crude Drug Research, 1986; 24(2): 64-68. Cited in the Aromatherapy Database, by Bob Harris, Essential Oil Resource Consultants, UK, 2000.
17. Sfeir J et al. *In vitro antibacterial activity of essential oils against Streptococcus pyogenes*. Evidence-Based Complementary and Alternative Medicine, 2013; 2013: 269161. doi: 10.1155/2013/269161
18. Baiju N et al. *Development of a novel surface disinfectant composition containing essential oils and a fruit acid against nosocomial pathogens commonly associated with environmental surfaces*. International Journal of Essential Oil Therapeutics, 2008; 2(1): 9-14. Cited in Quintessential Aromatics database, 2013.
19. Shukr MH, Metwally GF. *Evaluation of topical gel bases formulated with various essential oils for antibacterial activity against methicillin-resistant Staphylococcus aureus*. Tropical Journal of pharmaceutical Research, 2013; 12(6): 877-884. Cited in Quintessential Aromatics database, 2013.
20. Chandrashekar KS, Prasanna KS. *Analgesic and anti-inflammatory activities of the essential oil from Cymbopogon flexuosus*. Pharmacognosy Journal, 2010; 2(14): 23-25. Cited in Quintessential Aromatics database, 2013.
21. Lorenzetti BB et al. *Myrcene mimics the peripheral analgesic activity of lemongrass tea*. Journal of Ethnopharmacology, 1991; 34(1): 43-48. Cited in Quintessential Aromatics database, 2013.
22. Gayathri K et al. *Cardioprotective effect of lemon grass as evidenced by biochemical and histopathological changes in experimentally induced cardiotoxicity*. Human and Experimental Toxicology, 2010; 30(8): 1073-1082. doi : 10.1177/0960327110386391
23. Elson CE et al. *Impact of lemongrass oil, an essential oil, on serum cholesterol*. Lipids, 1989; 24(8): 677-679. Cited in Quintessential Aromatics database, 2013.
24. Ansari MA, Razdan RK. *Relative efficacy of various oils in repelling mosquitoes*. Indian Journal of Malariology, 32(3): 104-111. Cited in the Aromatherapy Database, by Bob Harris, Essential Oil Resource Consultants, UK, 2000.
25. Adeniran OI, Fabiyi E. *A cream formulation of an effective mosquito repellent: a topical product from lemongrass oil (Cymbopogon citratus) Stapf*. Journal of Natural Products and Plant Resources, 2002; 2(2): 322-327.
26. Sritabutra D et al. *Evaluation of herbal essential oil as repellents against Aedes aegypti (L.) and Anopheles dirus Peyton & Harrion*. Asian Pacific Journal of Tropical Biomedicine, 2011; 1(1): S124-S128. Cited in Quintessential Aromatics database, 2013.
27. Rajesvari R, Lakshmi T. *Lemon grass oil for improvement of oral health*. Dental Hypotheses, 2013; 4(4): 115-117. doi: 10.4103/2155-8213.122671
28. Blanco MM et al. *Neurobehavioural effect of essential oil of Cymbopogon citratus in mice*. Phytomedicine, 2009; 16(2/3): 265-270. Cited in Quintessential Aromatics database, 2013.
29. Goes TC et al. *Effect of lemongrass aroma on experimental anxiety in humans*. Journal of Alternative and Complementary Medicine, 2015; 21(12): 766-773. Cited in Quintessential Aromatics database, 2013.
30. Lawless J. *The encyclopaedia of essential oils*. Element Books, Shaftesbury, 1992.
31. Lavabre M. *Aromatherapy workbook*. Healing Arts Press, Rochester, 1997.
32. Davis P. *Aromatherapy an A-Z. 2nd edn*. The C.W. Daniel Company, Saffron Walden, 1999.
33. Holmes P. *Aromatica: a clinical guide to essential oil therapeutics – Vol. 1*. Singing Dragon, London, 2016.
34. Fischer-Rizzi S. *Complete aromatherapy handbook*. Sterling Publishing, New York, 1990.
35. Gumbel D. *Principles of holistic skin therapy with herbal essences*. Karl F. Haug Publishers, Heidelberg, 1986.
36. Chaisripipat W et al. *Anti-dandruff hair tonic containing lemongrass (Cymbopogon flexuosus) oil*. Forschende Komplementarmedizin, 2015; 22(4): 226-229. Cited in Quintessential Aromatics database, 2013.
37. Worwood VA. *The fragrant heavens*. Transworld Publishers, London, 1999.
38. Zeck R. *The blossoming heart – aromatherapy for healing and transformation*. Aroma Tours, East Ivanhoe, 2004.
39. Tisserand R, Young R. *Essential oil safety*. 2nd edn. Churchill Livingstone, Edinburgh, 2014.